

## **STATEMENT OF TEACHING PHILOSOPHY SUSAN STROME**

My teaching goals are to actively engage students in the learning and teaching process, promote a deep understanding of foundational concepts, and develop critical-thinking and problem-solving skills. My approach to teaching was transformed by a 2-week intensive workshop at Indiana University in 2003, in which we studied diverse modes of learning and worked together on developing innovative teaching strategies that actively engage students. My teaching approaches reflect those innovations.

### **Teaching Undergraduate Genetics (Biol 105, ~250 students)**

Genetics has the well-earned reputation for being a hard subject. My goal is to make Genetics understandable, relevant, and fascinating. Student comments and my course evaluations indicate that many students love the course and that my teaching approaches were key to their learning. My teaching approaches include:

- Making my learning goals for the students clear in the syllabus and on the first day of class and reminding students of those goals throughout the quarter.
- Preparing outlines for each class session that organize the material for that day, provide some illustrations, pose questions, include problems that we will work on in class, and leave lots of room for note taking. The outlines also point students to relevant book sections and pose key questions for the *next* class session. Outlines are available on our course web site before each week of classes.
- Using a variety of presentation tools during class, including a document camera to develop the outlines and work problems, and some PowerPoint slides and online movies.
- Identifying for students misconceptions that impede their learning.
- Using clickers to assess students' comprehension of material and ability to solve problems. If students do poorly, I have them discuss the clicker question among themselves or we discuss it as a class. I don't move on until my clicker assessment demonstrates good comprehension by a majority of students. For questions and feedback for which multiple-choice clicker questions don't work, I solicit student responses on index cards.
- Developing models, demonstrations, and skits to provide students with representations other than words and drawings and to bring important concepts to life. For example, chromosome behavior is at the heart of Genetics, yet even after high school and introductory college Biology, most students do not understand which chromosomes in a nucleus are similar (homologs), which are identical (sister chromatids), which are completely different (non-homologous chromosomes), and how they separate during mitosis and meiosis. I use pipe cleaners and beads in class to represent chromosomes and model key genetic concepts: homologs, sister chromatids, non-homologous chromosomes, mitosis, meiosis, ploidy, and complementation. To teach crossing over and recombination, I grow chromosomes from pipe cleaner size to pool noodle size, label genes on the pool noodles, and swap chromosome segments (with their resident genes). To teach epistasis, a class member and I act out a biosynthetic pathway and later in the quarter a signaling pathway.
- Offering workshops outside of class time and discussion sections to work on basic but challenging concepts, such as chromosomes, mitosis, and meiosis. For example, students work in groups with pipe cleaners and beads to model chromosomes and their behavior. Students often "get it" during such hands-on activities.
- Developing effective Problem Sets for students to work on individually or with each other and additional more challenging Discussion Section Problems for students to work on in groups guided by a Teaching Assistant.

My course teaches students the language of Genetics and how to reason their way through solving problems, an important learning skill. A favorite student comment in my 2011

evaluations was “Mitosis and meiosis always seem to come with each biology class I take. And I always just somewhat learned it for the tests. I finally understand it. Thank you!” Other comments and my 2013 rating averages of 4.57 for the Instructor and 4.38 for the Course attest to how much students appreciate having an upper level, required, and frightening course made understandable and even enjoyable (even at 8:00 in the morning!).

My “tool kit” of models and demonstrations is described and available on the Strome Lab web site (<http://bio.research.ucsc.edu/people/strome/Site1/Teaching.html>). I encourage other instructors to use clickers and freely share my bank of clicker questions. Additionally, I coauthored an article entitled “Decoding Genetics and Molecular Biology: Sharing the Movies in Our Heads” to encourage modeling of key concepts and developing other innovative teaching strategies.

### **Teaching Graduate Developmental Biology (Biol 200D, 8-15 students)**

I organized a new graduate core course, Advanced Developmental Biology, in 2010 and have taught half of it every year since then. This course is usually the 4th in a series of 4 core courses that our MCD Biology graduate students take their first year. My teaching approaches for Developmental Biology are:

- Making clear to the students what our learning goals for 200D are.
- Creating an atmosphere of group inquiry. I pose lots of questions to the students and encourage them to ask questions and offer their perspectives.
- Discussing key concepts and findings in a manner that encourages students to think for themselves about the big questions, how to interpret data, and where to go next. For example, even the process of drawing results and findings stepwise on a white board instead of flashing them up in a PowerPoint slide helps students consider the flow of findings, how to interpret them, and how the study answered questions and raised new ones. White board sessions give the class flexibility to pursue different discussion directions. I use PowerPoint slides as well, but avoid having them be too dense and too fast for students to follow.
- Involving the students in teaching. Most teachers would agree that the best way to learn is to teach. Several class sessions involve small groups of students in the class teaching each other. For example, the process of “X-chromosome dosage compensation” is achieved differently in different animals. I have one group of students research and present the needed background, key findings, and current view of how dosage compensation is achieved in mammals, while another group presents dosage compensation in insects. In addition to learning by teaching, students get practice assessing the importance of various findings, giving effective oral presentations, and engaging each other in discussion.
- Giving individual constructive feedback. On written homework assignments and after oral presentations, I provide feedback and offer suggestions for improvement to each student.

In 200D evaluations, my teaching is praised and appreciated. In my role as head of the Graduate Advising Committee in MCD Biology, I survey the graduate students each year (using an anonymous Survey Monkey questionnaire) on their satisfaction with the graduate core courses. Gratifyingly, 200D has earned top scores, and many students commented that 200D is the best of the core course series.

### **Teaching and Mentoring Graduate and Undergraduate Students in My Laboratory**

I am strongly committed to mentoring and advising students, helping each one build a strong set of research skills and develop the ability to think independently and communicate effectively, and exploring training and career options and facilitating progress toward trainees’ goals. I discuss each student’s research project with them on a regular basis and have students develop Individual Development Plans (IDPs). IDPs encourage students to reflect on their training and career goals, self assess their skills and competencies, discuss their goals and competencies with me, and work with me to develop short- and long-term training goals.